

Combustion

What Is Combustion?

Recycling, composting, and source reduction are vital activities for effective solid waste management, but 100 percent of people's trash cannot be handled by these methods. The remaining waste must be deposited in landfills or combusted (burned). Because of limited space, landfills are not always a viable option in many cities, making **combustors** (commonly referred to as incinerators) an important part of a community's integrated waste management system. Burning garbage can decrease the volume of waste requiring disposal by 70 to 90 percent.

Before the late 1970s, many people burned garbage in their backyards and in simple private and municipal combustors. These methods did not burn garbage completely, however, and allowed pollutants to escape into the atmosphere. With the passing of the Clean Air Act, combustor owners were directed to develop more effective methods of pollution control. Today's municipal waste



Key Points

- Municipal waste combustors burn waste at high temperatures to reduce its volume.
- The heat produced by burning waste in municipal waste combustors can be recovered as useful energy.
- Municipal waste combustors reduce the volume of garbage by 70 to 90 percent.
- Ash is a byproduct of combustion that must be disposed of in landfills or reused.
- Air pollution control equipment helps reduce air emissions.
- Specially designed incinerators can be used as a means of handling hazardous waste. The burning process reduces the toxicity of organic compounds in the waste.

combustors release significantly less pollutants into the air than the "backyard burners" and simple combustors. More than 100 municipal waste combustor plants currently exist nationwide, and nearly 20 percent of the municipal solid waste generated in the United States is combusted.

Facts about Municipal Waste Combustors

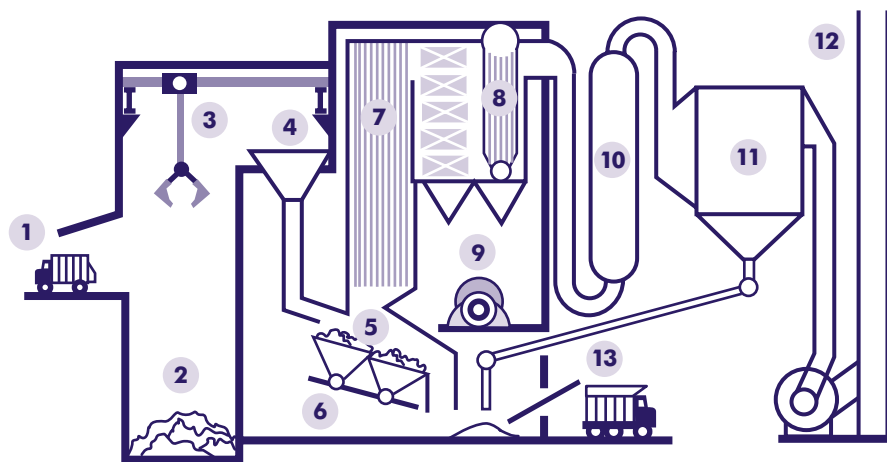
- Fire in the boiler of a combustor is often as hot as flowing lava (between 1,800 and 2,200 degrees Fahrenheit).
- In 1874, a new technology called "the destructor" provided the first combustor of municipal garbage in England.
- The first garbage incinerator in the United States was built on Governor's Island, New York, in 1885.

(Sources: Integrated Waste Services Association, 2000; Rubbish! The Archaeology of Garbage by William Rathje, 1990)

How Do Municipal Waste Combustors Work?

Municipal waste combustors dispose of trash by burning it at high temperatures. Not all municipal waste combustors are designed alike, but they function in a similar manner. Typically, a facility collects waste in a garbage receiving area or pit, where the garbage is mixed by a crane. The crane operator looks for large items

How Typical Combustion Facilities Work



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|---------------------------------|----------------------------|------------------------------------|---|
| 1. Tipping area for trucks | combustion zone | 8. Heat exchanger | 11. Fly ash and dust collector |
| 2. Refuse pit | 5. Primary combustion zone | 9. Turbine | 12. Stack |
| 3. Refuse crane | 6. Underfire air | 10. Scrubber, to remove acid gases | 13. Bottom ash and fly ash collection and transport |
| 4. Hopper, which sends waste to | 7. Furnace | | |

Hazardous Waste Combustion

In addition to combustion facilities that accept municipal (nonhazardous) waste, specially designed incinerators, boilers, and industrial furnaces, can burn hazardous waste. Hazardous waste, which is toxic, ignitable, corrosive, or reactive, can be produced by businesses or manufacturing operations. Combustion has some key advantages as a means of managing hazardous waste. First, burning hazardous waste reduces the volume of waste by converting solids and liquids to ash. Second, the burning process destroys toxic organic compounds in waste. Third, disposal of the ash in a landfill is safer and more efficient than disposal of untreated hazardous waste. The ash generated from hazardous waste combustion must be tested and, if found to be hazardous, must be treated for remaining toxicity before it is disposed of in a landfill.

that are not suitable for combustion (e.g., batteries and refrigerators) and removes them from the pit. The crane operator also uses the crane to lift piles of garbage into a large chute. From the chute, garbage falls into a combustion chamber or furnace and then moves along a series of sloping grates that work like conveyer belts. The garbage is burned as it moves forward.

After garbage is burned, some matter remains in the form of ash. There are two types of ash: bottom ash and fly ash. Bottom ash is the heavier, nonburnable material, such as glass and metal, that falls through the grate after burning. Large pieces of metal accumulate in this ash and are extracted from the ash with magnets. Bottom ash accounts for the majority of ash produced by incinerators, about 75 to 90 percent. Fly ash includes lighter particles that rise with hot gases as the garbage is burned and are captured by air pollution control equipment in the stacks. All ash generated by combustion facilities must be tested to determine if it is hazardous. If deemed hazardous, the ash is subject to special hazardous waste disposal regulations. If the ash

proves nonhazardous, it may be deposited in landfills specially designed to store it. Currently, studies are under way to investigate ways to reuse ash; for example, to replace soil as a landfill cover (generally applied at the end of each day to minimize odor, pests, and wind disturbances). Ash might also be used in road and building construction and as part of artificial offshore reefs. Whether the leftover ash is recycled or landfilled, it takes up much less space than the same materials in their original form.

What Are the Benefits of Municipal Waste Combustors?

Most municipal waste incinerators in the United States generate energy in the form of electricity because certain materials, such as paper, plastics, wood, and packaging, make excellent fuels. Producing this energy has about the same environmental impact as energy produced from natural gas and less of an environmental impact than energy produced from oil or coal. In other words, generating energy from municipal waste combustors contributes no more pollution—and sometimes less—than processes generating electricity using natural gas, oil, or coal. Waste-

to-energy plants also reduce the need to generate electricity from non-renewable natural resources such as oil and coal.



What Are the Challenges of Municipal Waste Combustors?

Although technologies to control pollution have improved significantly, burning certain materials still produces chemicals that contribute to air pollution. To minimize emissions of air pollutants into the atmosphere, municipal waste incinerators use special equipment (e.g., scrubbers and dust collectors) to remove pollutants. To protect air quality and monitor the hazardous constituents in ash, EPA established regulations that apply to all large municipal solid waste units (those with the capacity to burn more than 250 tons of garbage per day). The regulations significantly reduce toxic air emissions such as dioxin, acid gas, lead, cadmium, and mercury.

Many people do not want incineration sites near their homes. The “NIMBY (Not In My Back Yard)” attitude makes finding appropriate sites for municipal waste combustors a challenge for many municipalities. There are, however, opportunities for the public to participate in deciding where a combustor will be located. Officials must hold a public meeting to inform the community about the size of the combustor, as well as the amount of waste generation and ash to be discarded.

Additional Information Resources:

Visit the following Web sites for more information on municipal and hazardous waste combustion and solid waste:

- U.S. Environmental Protection Agency (EPA): <www.epa.gov>
- U.S. EPA, Office of Solid Waste site on combustion:
<www.epa.gov/epaoswer/non-hw/muncpl/disposal.htm>
- U.S. EPA, Office of Solid Waste site on hazardous combustion:
<www.epa.gov/epaoswer/hazwaste/combust>

To order the following additional documents on combustion and solid waste, call EPA toll-free at 800 424-9346 (TDD 800 553-7672) or look on the EPA Web site
<www.epa.gov/epaoswer/osw/publicat.htm>.

- *Decision-Makers' Guide to Solid Waste Management, Volume II* (EPA530-R-95-023).
- *Sites for our Solid Waste: A Guidebook for Public Involvement* (EPA530-SW-90-019)
- *A Collection of Solid Waste Resources*—CD-ROM (EPA530-C-98-001)

The following trade associations can provide information about combustion as well:

Integrated Waste Services Association

1401 H Street, NW., Suite 220
Washington, DC 20005
Phone: 202 467-6240
Fax: 202 467-6225
E-mail: lwsa@ix.netcom.com

Environmental Industry Associations

4301 Connecticut Avenue, NW.,
Suite 300
Washington, DC 20008
Phone: 202 244-4700
Fax: 202 966-4841

Solid Waste Association of North America

P.O. Box 7219
Silver Spring, MD 20907-7219
Phone: 301 585-2898
Fax: 301 589-7068
Web site: <www.swana.org>